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EXAMINER

WARREN, MATTHEW E

ART UNIT PAPER NUMBER

2815

DATE MAILED: 03/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/050,171

Applicant(s)

WATANABE

Examiner

Matthew E. Warren

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 March 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office Action is in response to the Amendment filed on December 15, 2003.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 7-19 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Independent claims 7, 14, 16, and 17 include the limitation of the insulating regions being disposed in such a manner that "an area ratio of the recess...within a first frame area having as an outer periphery an outer periphery of the pad part and having a first width, becomes larger than an area ratio of the recess in a second frame area having as an outer periphery an inner periphery of the first frame area and having a second width." Claims 16 and 17 contain variations of that limitation. The language is not supported by the specification because that statement implies that the area ratio of the first frame area ($L1/W1$) is larger than the area ratio of the second frame ($L2/W1$) (as seen in fig. 2A). The specification does not disclose that comparison and only mentions that the area ratio of the near wiring area and first frame area is large and is

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preferably 30% or higher. In fact, the area ratio of the near area and second frame area ($L2/W1$) was not disclosed in the specification.

Claims 16 and 17 are further rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 16 and 17 contain additional subject matter pertaining to a square measurement of the recess, total square measurement of the recess in the first and second frame areas, and several divisions of those measurements for calculating the ratio and making comparisons. The specification does not support the limitations of the new, more complex calculation and does not mention any square measurements of the frame area.

Added claims 18 and 19 continue to add subject matter pertaining to square measurements and calculating area ratios. As stated above, the specification does not support the added limitations of the area ratio and does not mention or even suggest any square measurements of the frame area.

Due to the 112 Rejection above, all of the independent claims are interpreted to only include the following limitations:

A semiconductor device comprising:

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a semiconductor substrate; a first interlayer insulating film made of insulating material formed on the semiconductor substrate; a first intra-layer insulating film made of insulating material and formed on the first interlayer insulating film, the first intra-layer insulating film being formed with a recess reaching a bottom of the first intra-layer insulating film, the recess having a pad part and a wiring part, continuous with the pad part, the pad part having a width wider than a width of the wiring part, a plurality of insulating regions, wherein the pad has a near wiring area superimposed upon an extended area of the wiring part into the pad part, a first frame area having as an outer periphery an outer periphery of the pad part and having a first width, and a second frame area having as an outer periphery an inner periphery of the first frame area and having a second width, the device further comprising a first pad filled in the pad part of the recess and a wiring filled in the wiring part of the recess.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 7-17, as far as understood, are rejected under 35 U.S.C. 102(e) as being anticipated by Harada et al. (US 6,417,575 B2).

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In re claim 7, Harada et al. shows (figs. 77A-77C) semiconductor device comprising a semiconductor substrate (1), a first interlayer insulating film (7) made of insulating material formed on the semiconductor substrate, and a first intra-layer insulating film (230) made of insulating material and formed on the first interlayer insulating film. The first intra-layer insulating film is formed with a recess reaching a bottom of the first intra-layer insulating film, the recess having a pad part (lower wide portion of pad 240 in fig. 77B) and a wiring part (upper left extension of pad 240 within layer 230d) (or see left extension in fig. 77A), continuous with the pad part, the pad part having a width wider than a width of the wiring part. A plurality of insulating regions (341) are formed in the pad area. The pad seen in fig. 77A has a near wiring area superimposed upon an extended area of the wiring part into the pad part (imaginary near wiring area if wiring part extends partially into pad part). As seen in fig. 77A, a first frame area has as an outer periphery an outer periphery (250) of the pad part and having a first width, and a second frame area has as an outer periphery an inner periphery (240) of the first frame area and having a second width. The device further comprises a first pad (material of 240) filled in the pad part of the recess and a wiring filled in the wiring part of the recess.

In re claim 8, Harada shows (fig. 77C) second interlayer insulating film (15) is formed on the first intra-layer insulating film, the first pad and the wiring. The second interlayer insulating film is formed with at least one via hole (lower portion of 251), the via hole being superimposed upon the first pad. A second pad (101) is formed on the

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second interlayer insulating film and is connected to the first pad via a region in the via hole. The via hole is included in the first pad.

In re claim 9, Harada shows (fig. 77A) all the limitations as expressed above in re claim 7 and additionally shows that the recess is formed so that the insulating regions (341) are not disposed in a near wiring area superimposed upon an extended area of the wiring part into the pad part. As can be seen from the top view, the insulating regions are not formed in the small area imagined as the near wiring area (the area where the wiring portion extends into the pad area). The insulating regions are disposed in a second frame area which has as outer periphery an inner periphery of the first frame area and has a second width (the width of the second frame area which contains the insulating regions is the width of the insulating regions).

In re claim 10, Harada shows (fig. 77A) that the four insulation regions (341) are not disposed in a central area on an inner side of the second frame area.

In re claim 11, Harada shows (fig. 77A) in a top view that the via (251) is included in the first pad.

In re claim 12, Harada shows (fig. 81) an alternate embodiment a plurality of insulating regions (341) are disposed regularly and have a first pitch (space 340 between the insulating regions). As seen from the drawings, the width of the first frame area (width between lines 250 and 240) is wider than the first pitch of the insulating regions.

In re claim 13, Harada discloses (col. 8, lines 10-45 in conjunction with the figures 77A-77C and 87) that a wire bond step is performed on the upper or second

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pad. The insulating regions (341) are not disposed in a central area on an inner side of the second frame area. The via hole (251) of the upper or second pad is disposed in the central area. A contact area between the conductive wire and the second pad extends to an area on an outer side of the via hole as viewed from above because the wire bond would cover the top surface of the pad which has the via in its center.

In re claim 14, Harada shows all of the limitations as discussed above in re claim 7.

In re claim 15, Harada shows (fig. 77A) all the limitations as expressed above in re claim 7 and additionally shows that the recess is formed so that the insulating regions (341) are not formed in the first frame area (width between lines 250 and 240). The insulating regions are disposed in a second frame area which has as outer periphery an inner periphery of the first frame area and has a second width (the width of the second frame area which contains the insulating regions is the width of the insulating regions).

In re claims 16 -19, Harada shows all of the Harada shows all of the limitations as discussed above in re claim 7.

Response to Arguments

Applicant's arguments filed with respect to claims 7-17 have been fully considered but they are not persuasive. The applicant primarily asserts that specification supports the limitations concerning the area ratios of the recess and that the limitations of the claims overcome the prior art references. The examiner still maintains the 112 Rejection and because of the interpretation of the claim limitations,

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the 102 Rejection of the claims is still proper. The examiner believes that the limitations of the claims still do not properly convey what is mentioned in the specification. The only mention of a ratio in the spec comes from page 12 which mentions a ratio of the length (L1) of a first frame area and a width W1 of the near wiring area (27b) (refer to fig. 2A). The applicant's explanation of the "area ratio of the recess in a near wiring area" being S_r/S_n is not supported by the specification because that limitation seems to denote that the ratio pertains to the square measurement (or area = length x width) of the frame areas or near wiring areas. The specification only mentions a ratio of lengths (or widths) of the frame portions and not an area. Furthermore, the specification does not mention that one ratio is larger than another. It only mentions that the L1/W1 ratio of the first frame area is about 35% (page 12). It seems that the applicant is trying to suggest that the ratio of area in the second frame area is larger because of number of insulation regions (21a) that make the actual total area of the second frame area (27c) smaller. If that is the intended goal then such a limitation is not clearly conveyed in the specification. Furthermore, the drawings don't really suggest that the "area" of the various regions (27a, 27a, 27c, and 27b) are supposed to be highlight since the drawings only denote single dimensions (length or width). For these reasons, the 112 Rejection still stands and the examiner interprets the limitations as best as could be understood. The 102 Rejection shows all of the elements of the interpreted claims and this action is therefore made final.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Warren whose telephone number is (571) 272-1737. The examiner can normally be reached on Mon-Thurs, and alternating Fri, 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MEW
MEW
March 22, 2004

GECKERT
GEORGE ECKERT
PRIMARY EXAMINER